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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Atul Kelkar

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05/23/2008

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EXAMINER

OCHOA, JUAN CARLOS

ART UNIT

PAPER NUMBER

2123

NOTIFICATION DATE

DELIVERY MODE

05/23/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

RockMail@reinhartlaw.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/731,742	<b>Applicant(s)</b> KELKAR ET AL.	
	<b>Examiner</b> JUAN C. OCHOA	<b>Art Unit</b> 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 3/10/08.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. In view of the Appeal Brief (AB hereinafter) filed on 3/10/08, PROSECUTION IS HEREBY REOPENED. A new ground of rejection is set forth below.

2. To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

3. A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Paul L Rodriguez/

Supervisory Patent Examiner, Art Unit 2123

4. Claims 1 and 3–16 are presented for examination. Any previous indication of allowability of claims 8, 9 and 16 is withdrawn, because claims contain 35 U.S.C. 112, second paragraph, deficiencies.

***Claim Interpretation***

5. Office personnel are to give claims their "broadest reasonable interpretation" in light of the supporting disclosure. In re Morris, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541,550-551(CCPA 1969). See \*also In re Zletz, 893 F.2d 319,321-22, 13 USPQ2d 1320, 1322(Fed. Cir. 1989) ("During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow").... The reason is simply that during patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed.... An essential purpose of patent examination is to fashion claims that are precise, clear, correct, and unambiguous. Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.

6. Claim 1, recites: "... structural energy ...". Application description page 6, paragraph [0027], lines 6–7 read: "...The control system 100 includes acoustic pressure sensors 104 (e.g., microphones) and structural vibration sensors ...". Since "structural energy" is not elaborated in the Application description, Examiner interprets "structural energy" as the "structural vibration" of Application description page 6, paragraph [0027], lines 6–7.

***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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8. Claims 1 and 3–16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Claims 1, 8, 9, and 16, as written, fail to perform the method set forth in the preamble, more specifically “design a **feedback** controller”. Claims 1, 8, 9, and 16, as written, design a “**passivity-based** controller”. Examiner notes that a passivity-based controller may be series, feed-forward, feedback, hybrid, or other types (see “Compensation is designed to render the mathematical model passive in the sense of mathematical system theory. The compensation may be series, feed-forward, feedback, hybrid, etc.” in Application description page 4, [0013]).

10. Dependent claims inherit the defect of the claim from which they depend.

### **Claim Rejections - 35 USC § 103**

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**14. Examiner notes that the NPL reference Kelkar and Joshi, (Kelkar hereinafter), Robust Passification And Control Of Non-Passive Systems submitted along with this rejection is being furnished to ensure that the page numbers are of record. This Kelkar NPL reference has pages 3133–3137. The Kelkar NPL reference which Applicant submitted has different page numbers.**

15. Claims 1 and 10–15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kelkar, taken in view of Son et al., (Son hereinafter), Stabilization Of Linear Systems Via Low-Order Dynamic Output Feedback: A Passification Approach, further in view of H. R. Pota and A. G. Kelkar, (Pota hereinafter), Modelling And Control Of Acoustic Ducts, (see IDS dated 12/09/03) and further in view of Pota, Reza Moheimani, and Smith, (Pota (2) hereinafter), Resonant Controllers For Flexible Structures.

16. As to claim 1, Kelkar discloses a method to design a feedback controller for extracting acoustic energy and structural energy in an acoustic enclosure comprising the steps of: obtaining a continuous-time multi-input multi-output (see page 3134, col. 1, 2nd paragraph, lines 10–12) state-space mathematical model (see page 3134, col. 1, 2nd paragraph, lines 1–4) of the acoustic enclosure; and checking passivity of the compensated system (see page 3136, col. 2, 2<sup>nd</sup> paragraph, lines 1–8).

17. While Kelkar teaches obtaining a continuous-time multi-input multi-output state-space mathematical model of the acoustic enclosure and checking passivity of the compensated system, Kelkar fails to teach designing compensation to render the mathematical model passive. Son teaches designing compensation to render the mathematical model passive in accordance with mathematical system theory if the mathematical model is not passive, thereby forming a compensated system that is passive (see page 3822, col. 2, lines 5–11).

18. Therefore, it would have been obvious to one of ordinary skill in this art at the time of invention by applicant to utilize the steps of Son in the method of Kelkar because Son renders a linear time-invariant (LTI) system passive and stable via dynamic output feedback (see page 3822, col. 1, lines 1–3), and as a result, Son reports the following improvement over his prior art: dynamic output feedback as passification as well as stabilization that can be solved by using SOF algorithms, e.g. LMI (see page 3826, col. 2, 2<sup>nd</sup> paragraph).

19. While the Kelkar–Son method obtains a continuous-time multi-input multi-output state-space mathematical model of the acoustic enclosure; and checking passivity of

the compensated system and Son teaches designing compensation to render the mathematical model passive, the Kelkar–Son method lacks a passivity-based controller that extracts at least one of acoustic energy and structural energy such that a resulting closed-loop response provides a desired noise reduction.

20. Pota teaches designing a passivity-based controller that extracts structural vibration (see “structural vibration” as “A resonant controller [22] is a part of this compensator. Resonant controllers have proved effective in damping vibrations in flexible structures” in page 9, col. 1, 2nd paragraph, lines 14–16) and acoustic energy such that a resulting closed-loop response provides a desired noise reduction. (See “The experimental results of a new robust broadband feedback controller, designed using passivity-based techniques, are presented” in page 2, Abstract, lines 5–7; “noise cancelling feedforward controller” in page 6, col. 2, section 4.1 Infinite Dimensional Controller; and “The acceleration to the medium  $Q_a(s)$  and  $Q_b(s)$ , i.e., the acoustic energy, is provided by speakers attached to one end of the duct and the middle of the duct as shown in Fig. 2.” in page 5, col. 1, 2<sup>nd</sup> paragraph and in Fig. 2).

21. Therefore, it would have been obvious to one of ordinary skill in this art at the time of invention by applicant to utilize the controller of Pota in the method of Kelkar and Son because Pota presents a new method to obtain finite dimensional approximations of infinite-dimensional models using quartic functions (see page 2, Abstract, lines 3–4), and as a result, Pota reports a method with an improved accuracy and reduction in computational requirements to obtain finite-dimensional approximation to the infinite-dimensional analytical models (see page 9, col. 2, last paragraph, lines 5–8).



22. While Pota discloses a passivity-based controller that extracts structural vibration as “Resonant controllers have proved effective in damping vibrations in flexible structures”, Pota does not expressly disclose a passivity-based controller that extracts structural vibration such that a resulting closed-loop response provides a desired noise reduction. Examiner notes that Pota points to Pota (2) as its reference “[22]” in page 9, col. 1, 2nd paragraph, lines 14–16).

23. Pota (2) teaches a passivity-based controller that extracts structural vibration such that a resulting closed-loop response provides a desired noise reduction. (See page 631, col. 2, last paragraph).

24. Kelkar, Son, Pota, and Pota (2) are analogous art because they are related to active noise control.

25. Therefore, it would have been obvious to one of ordinary skill in this art at the time of invention by applicant to utilize the controller of Pota (2) in the Kelkar–Son–Pota method because Pota (2) presents three resonant modes being damped simultaneously using one sensor-actuator pair and three parallel combination of resonant mode controllers (see page 635, col. 2, 1<sup>st</sup> paragraph), and as a result, Pota (2) reports on the effectiveness of his resonant controllers, which have a simple structure and which can be implemented very easily using passive circuit elements and two op-amps (see page 635, col. 2, last paragraph to page 636, col. 1, 1<sup>st</sup> paragraph).

26. As to claim 10, Kelkar discloses a method wherein the step of designing compensation to render the mathematical model passive comprises the steps of: determining if a feedforward compensation will passify the system; if a feedforward

compensation will not passify the system: designing a constant gain feedforward compensation to render the compensated system minimum-phase; and rendering the compensated system positive-real by at least one of series compensation, sensor-blending and control allocation (see page 3133, col. 2, last paragraph, lines 17–22).

27. As to claim 11, Kelkar discloses a method wherein the step of designing a passivity-based controller comprises the step of designing one of a dissipative linear-quadratic-Gaussian (LQG) type positive-real controller and a dissipative constant gain positive-real controller (see page 3136, col. 2, 1st paragraph, last 5 lines).

28. As to claim 12, Kelkar discloses a method wherein the step of rendering the compensated system positive-real by at least one of series compensation, sensor-blending and control allocation comprises the step of rendering the compensated system positive-real by at least one of series compensation, feedback compensation (see page 3133, col. 2, last paragraph, lines 7–10), hybrid compensation, and sensor-blending and control allocation.

29. As to claim 13, Kelkar discloses a method further comprising the step of redesigning the compensation if the passivity is not preserved if mathematical model parameters are perturbed from nominal values (see "iterative controller design" in page 3136, col. 2, Concluding Remarks, lines 6–8).

30. As to claim 14, Son discloses a method further comprising the step of performing numerical simulations of the controller in the presence of a simulated broadband disturbance input to determine if the closed-loop response is satisfactory (see page 3825, col. 2, 3<sup>rd</sup> paragraph).

31. As to claim 15, Son discloses a method further comprising the step of redesigning the controller if the closed-loop response is not satisfactory (see page 3825, col. 2, 3<sup>rd</sup> paragraph).

### **Allowable Subject Matter**

32. Claims 3–7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. A reason for the indication of allowable subject matter was provided in the office action submitted 9/11/07.

33. Claims 8, 9 and 16 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112 set forth in this Office action. A reason for the indication of allowable subject matter was provided in the office action submitted 9/11/07.

### **Response to Arguments**

34. Applicant's arguments filed in the AB filed 3/10/08 have been fully considered, but they are not persuasive.

35. Regarding the rejection under 103. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection. In the instant rejection, Examiner has elaborated prior art disclosures of claim 1.

### **Conclusion**

36. Examiner would like to point out that any reference to specific figures, columns and lines should not be considered limiting in any way, the entire reference is considered to provide disclosure relating to the claimed invention.

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37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan C. Ochoa whose telephone number is (571) 272-2625. The examiner can normally be reached on 7:30AM - 4:00 PM.

38. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

39. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. C. O./ 5/7/08

Examiner, Art Unit 2123

/Paul L Rodriguez/

Supervisory Patent Examiner, Art Unit 2123